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NATIONAL DAM INSPECTION PROGRAM. MINERSVILLE DAM NUMBER 4 (NDI---ETC(U)
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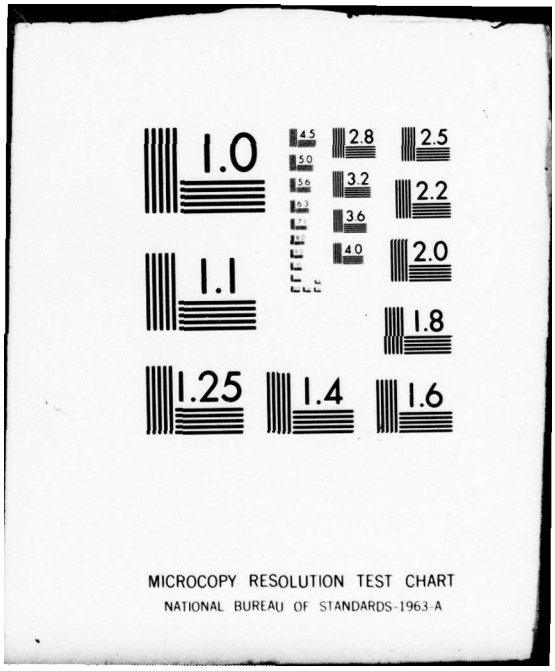
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DELAWARE RIVER BASIN

MINERSVILLE DAM NO. 4

NDI NO. PA-00675
DER NO. 54-39

SCHUYLKILL COUNTY, PENNSYLVANIA

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

PREPARED FOR
DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

BY

Berger Associates, Inc.
Harrisburg, Pennsylvania

APRIL 1979

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(6) National Dam Inspection Program. Minersville Dam Number 4 (NDI-PA-00675, DER-54-39), Delaware River Basin, Schuylkill County, Pennsylvania. Phase I Inspection Report.

(15) DACW31-79-C-0002

PREFACE

This report has been prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evoluntionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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PHASE I REPORT

NATIONAL DAM INSPECTION PROGRAM

[CONT'D FROM P. 1]

BRIEF ASSESSMENT OF GENERAL CONDITIONS AND RECOMMENDATIONS

Name of Dam:	Minersville Dam No.4, NDS NO. PA-00675
State & State No.:	PENNSYLVANIA, 54-39
County:	SCHUYLKILL
Stream:	DYER RUN
Date of Inspection:	November 2, 1978

Based on the visual inspection, past performance and the available engineering data, the dam and its appurtenant structures appear to be in good condition.

The hydrologic and hydraulic calculations indicate that the spillway for this dam has the capacity for passing 47 percent of the Probable Maximum Flood (PMF) without overtopping the embankment. Although 1/2 PMF will cause some overtopping, the depth of flow due to the overtopping is less than that judged to cause failure and therefore, the spillway, while inadequate, is not considered seriously inadequate.

The following recommendations are made for action by the owner:

1. That the seepage discharge from the toe of the embankment be observed and recorded on a regular basis, noting clarity and volume of the flow. If color appears or if the volume of flow increases, take immediate steps to determine the cause and implement remedial action.

2. That a detailed hydrologic and hydraulic analysis be made including recommendations to improve the spillway capacity.

3. Develop a means for positive cutoff or closure of the upstream end of the 24-inch pipe in the event of an emergency.

4. That the apparent good maintenance be continued on a regular basis.

5. That a formal downstream warning system be developed and implemented along with a procedure for surveillance during periods of high or prolonged rainfall or during other emergency conditions.

SUBMITTED BY:

BERGER ASSOCIATES, INC.
HARRISBURG, PENNSYLVANIA

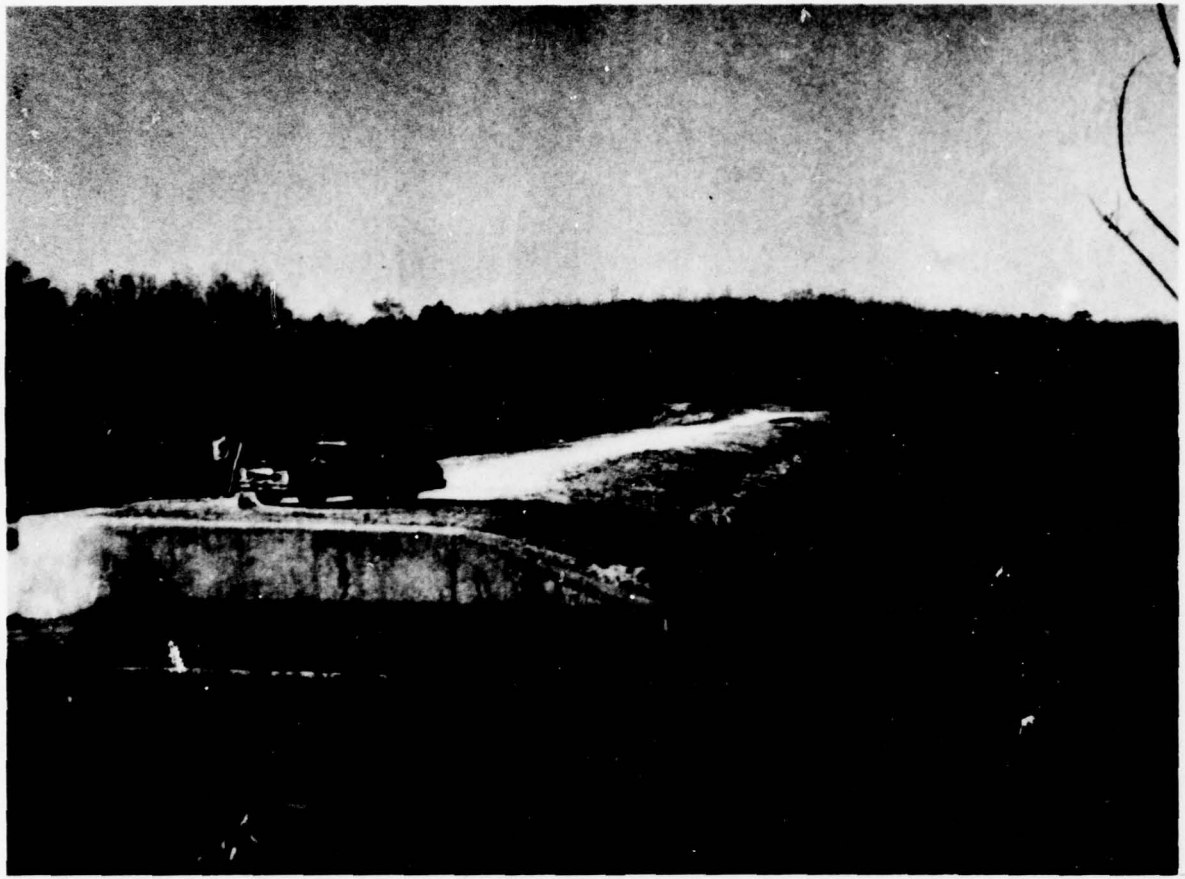
DATE: April 6, 1979

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
HENDRIK JONGSMA
ENGINEER
No. 5557E

APPROVED BY:

G. R. WITHERS
Colonel, Corps of Engineers
District Engineer

DATE 22 Apr 79



OVERVIEW - MINERSVILLE DAM NO.4

TABLE OF CONTENTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

MINERSVILLE DAM NO.4

NDS-ID NO. PA-00675
DER-ID NO. 54-39

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

A. Authority

The Dam Inspection Act, Public Law 92367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspections of dams throughout the United States.

B. Purpose

The purpose is to determine if the dam constitutes a hazard to human life and property.

1.2 DESCRIPTION OF PROJECT

A. Description of Dam and Appurtenances

The Minersville Dam No.4 is a rockfill dam with a concrete core wall in the center of the dam section. The dam is a modified structure which was originally built in 1912. The dam, at that time, had the overflow structure at the center of the embankment and consisted of a concrete slab constructed across the breast and over a 1-1/2 foot deep vertical notch in the core wall. The flow across this broad crested weir was allowed to discharge over the downstream rock slope. The dam was modified in 1928 when the embankment was enlarged and a new spillway was constructed at the left abutment of the embankment. In 1974 repairs and improvements to the spillway were made as a result of damages incurred during the 1972 (Agnes) storm.

The dam, as it now stands, is a rockfill dam with a concrete core wall. This wall is founded on rock. The top of the core wall is at elevation 1432.5 which is 2.5 feet below the crest elevation of the embankment at elevation 1435.0. (Note: Project datum is 25 feet less than the USGS elevations). [CONT'D ON P. ii]

The downstream slope is a rockfill having a slope ratio of 1.5H to 1V. The upstream slope is also rockfill with a slope ratio of 3H to

1V down to elevation 1420, then 3.5H to 1V to the upstream toe. The upstream slope surface above the waterline, is filled with some sand and gravel.

The spillway, at the left abutment, is a 65 foot long broad crested weir with a crest elevation of 1430.0 (five feet below the top of dam). Concrete walls channelize the discharge down a concrete chute to a concrete drop structure which forms the stilling basin for the outflow. A rip-rapped channel directs the flow from the stilling basin to the natural channel of Dyer Run.

The outlet for this dam is a 24-inch cast iron pipe. The control structure is a valve house located at the downstream toe of the embankment. Three valves regulate the flow through this structure including two 24-inch and one 10-inch. The 10-inch is used as a low flow control bypass.

The dam is used as a reserve water supply source for the Minersville Water Authority.

B.	Location:	Cass Township, Schuylkill County U.S.G.S. Quadrangle, Minersville, PA Latitude 40°-44.7', Longitude 76°-17.8' Appendix F, Plates I and II
C.	Size Classification:	Small (Height = 37 feet) (Storage = 324 acre-feet)
D.	Hazard Classification:	High (See Section 3.1.E)
E.	Ownership:	Minersville Water Authority 243 North Street Minersville, PA
F.	Purpose:	Water Supply

G. Design and Construction History

The Minersville Dam No.4 was designed by William Dechant, Engineers of Reading, Pennsylvania, and constructed by the Minersville Water Company in 1912. This dam was a rockfill dam with a concrete core through the embankment and is founded on rock. The embankment length was about 650 feet and its height was 37 feet above the Dyer Run streambed. The concrete core wall was 3 feet 6 inches at the top and 5 feet 6 inches thick at the bottom and was reinforced with steel rails, steel wire and galvanized iron. The wasteway (spillway) consisted of a 100-foot wide broad crested weir made of a concrete slab across the top width of the embankment on a 1-1/2 foot deep notched portion of the core wall. The discharge, which was allowed to flow down over the downstream rock slope was indicated as 570 cfs at the full spillway capacity.

The outlet consisted of a 24-inch pipe encased in concrete over its entire length. Controls for this outlet were contained in a valve house located at the toe of the downstream slope of the embankment.

Commonwealth inspectors noted the low capacity of the spillway and required the owner to improve this condition. The requirement was met by adding one foot to the core wall height in 1914.

In 1928, the Water Company made application to the then Pennsylvania Department of Forests and Waters to make modifications to the dam. The modifications were major. The top of the dam elevation was raised and an entirely new spillway and outlet channel was constructed. Refer to Plate III, Appendix F, for details.

In 1933, application was made to permit the installation and use of flashboards on the spillway crest. The use of the flashboards was to be temporary using them only during periods of extended dry weather. The application was approved for a period of two years. It was renewed in 1935 for an additional two years. In reality the flashboards have been used beyond 1937 to as late as 1977 without a new permit. A recent application for a flashboard permit was refused by PennDER.

In 1974, repairs designed by Gannett, Fleming, Corddry and Carpenter, were made to the spillway of this dam as a result of erosion of the outlet channel due to high intensity storms, especially the 1972 (Agnes) storm. Several contracts were awarded for cleaning debris from the spillway outlet channel, construction of a new spillway outlet channel slab, guniting of eroded and badly weathered concrete surfaces and construction of a drop type structure to form a stable stilling basin.

The dam at the present time reflects the above noted modifications and repairs.

H. Normal Operating Procedures

The water from Dam No.4 is used for domestic water supply. Water is released from this dam through the 24-inch outlet pipe to the natural stream channel of Dyer Run where it flows about 1.8 miles downstream to a smaller reservoir where the distribution facilities are located. The use of the No.4 dam is dependent upon the demands on the lower reservoir.

1.3 PERTINENT DATA

A. Drainage Area (square miles)

Computed for this report - 2.43

From Report to Water Supply Commission regarding dam application - 2.56 Use 2.43

B. Discharge at Dam Site (cubic feet per second)
See Appendix C for hydraulic calculations)

Maximum known flood, June 22, 1972, estimated on basis of nearby gaging station (peak inflow)	630
24-inch blowoff at pool elevation 1430.2 feet	66
24-inch blowoff at pool elevation 1405 feet	21
Spillway capacity at pool elevation 1435 feet (top of dam)	2,270

C. Elevation (feet project datum, add 25 for approximate feet above mean sea level)

Top of dam (design elevation)	1,435
Top of dam (low point)	1,435.1
Spillway crest	1,430.2
Blowoff and outlet pipe invert upstream end	1,403
Blowoff and outlet pipe invert downstream end, about	1,401
Stream bottom at centerline of dam, estimate	1,400
Normal pool	1,430.2

D. Reservoir (feet)

Length of maximum pool	1,700
Length of normal pool	1,300

E. Storage (acre-feet)

Spillway crest (Elev. 1,430.2)	196
Top of dam (Elev. 1,435)	324

F. Reservoir Surface (acres)

Top of dam (Elev. 1,435)	30
Spillway crest (Elev. 1,430.2)	22

G. Dam (Refer to Plate III, Appendix F, for plan)

Type: Rockfill with concrete core wall.

Length: 825 feet including 65 foot spillway.

Height: 37 feet to stream bottom.

Top Width: 27-1/2 feet.

Zoning: None

Cutoff: Concrete core wall - reinforced, founded on rock.

H. Outlet Facilities

The outlet facility consists of a 24-inch cast iron pipe extending through the embankment a distance of approximately 220 feet. Closure is by two 24-inch gate valves in series about 20 feet from the downstream end of the pipe. A gated 10-inch pipe takes off from the 24-inch pipe between the two valves and provides for closer regulation of small releases. All three valves are protected by a well-maintained valve house. There is no closure on the reservoir end of the 24-inch outlet pipe.

All water is released to Dyer Run. Domestic water supplies are taken, as needed, from a smaller reservoir 1.8 miles downstream.

I. Spillway

Type: Uncontrolled broad crested weir.

Length of weir: 65 feet.

Crest elevation: 1,430.2.

Upstream channel: Rectangular channel with concrete paved invert. 12H to 1V slope up to crest.

Downstream channel: 24H to 1V rectangular concrete chute 105 feet long leads to 30-foot by 50-foot concrete drop structure with five concrete baffles. Grade drops 12 feet in structure. Remaining 150 feet of chute in unlined channel in bedrock with riprap sides.

J. Regulating Outlets

See Section 1.3.H above.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

As previously noted, the Minersville Dam No.4, is a modified dam which was originally built in 1912 with major changes to the embankment configuration and spillway location in 1928. An examination of the available files and records did not locate any engineering calculations for any of the designs. The engineering data are limited to several design drawings which detail the 1928 changes. Specifications for the 1974 repairs and improvements are on file with the owner. These documents do not include any engineering criteria or calculations.

2.2 CONSTRUCTION

The building of Dam No.4 must be reconstructed from the permit applications and the inspection reports prepared by inspectors of the Commonwealth of Pennsylvania. There are no engineering data or records in the files regarding the construction of the original 1912 structure or the 1928 modification. Contract documents for the 1974 repairs and improvements are with the owner.

2.3 OPERATION

There are no engineering data in the files relative to the operation of this dam. As mentioned earlier, the use of this dam is dependent upon the demand made upon the smaller supply reservoir downstream. The 24-inch outlet pipe is the major control for discharges from this facility. Engineering information for review regarding spillway and outlet capacities were not on file.

2.4 EVALUATION

A. Availability

The availability of engineering data for design and construction of this dam are very limited. The narrative reports, record photographs and the few drawings have to be relied upon to assess the condition of this facility.

B. Adequacy

The information available from the files is not independently suitable for making a detailed evaluation of the dam. However, the visual inspection, field measurements, and observed condition together with currently developed hydrologic and hydraulic calculations and the available information do permit a reasonable assessment of the condition of the dam and its capacity to pass high discharge flows.

C. Operating Records

There are no formal operating records on file for review. Information on the operation of the dam was obtained in conversation with the owner.

D. Post Construction Changes

The post construction changes (after 1912) are described in permit applications, inspection reports and the available drawings. Engineering criteria or calculations are not included in the files.

SECTION 3 - VISUAL INSPECTION

3.1 *FINDINGS*

A. General

The outward appearance of this dam is good. The riprap cover on the upstream and downstream slopes was found to be undisturbed. The top of the embankment has a gravel surface which provides good vehicle access to the spillway area. Repairs to the spillway and its outlet channel add to the good appearance of this facility. The outlet control valves are well maintained and are in good operating condition.

Steady seepage from the downstream toe of the embankment is collected and discharged to the outlet channel. This condition is apparently under control.

The visual check list is presented in Appendix A and photographs are included in Appendix E.

B. Embankment

The upstream and downstream slopes of the embankment are in good condition. The downstream slope is composed of dumped rock. The upstream slope surface is composed of sand and gravel over dumped rock to the waters edge. The top of the embankment is covered with a gravel surface and provides a good roadway surface as access to the spillway area.

The surveyed profile across the top of the dam showed a nearly uniform top of dam elevation. Variation was 0.1 foot over its length. There are no obvious low sections on the crest. A cross section of the embankment, surveyed at this same time, shows the downstream slope as 33°45' or 1-1/2H to 1V. This corresponds with the design plans. The upstream slope was measured at 2-1/2H to 1V to the waters edge. The top of the embankment was measured at 27.5 feet in width.

Inspection of the downstream slope did not reveal any seepage from the slope surface. At one location near the center of the dam and to the left of the valve house, there is an exposed drainage collection point for seepage control at the toe of the embankment. The area is surrounded with dumped rock and an 8-inch steel pipe leads from this area to the outlet channel of the blowoff pipe. The seepage was observed to be small (less than 2 gallons per minute) and clear and is apparently under control.

An additional source of water flow was observed approximately 50 feet downstream from the toe of the embankment along the right abut-

ment. This flow is steady and flows overland to the blowoff outlet channel. The water is clear and the estimated flow at time of inspection was less than 2 gallons per minute. The source of this flow could be the reservoir, but it is far enough from the embankment so that it is not considered a threat to the stability of the structure.

The abutments of the embankment, at the right with the original ground surface and at the left with the spillway, were observed to be sound.

C. Appurtenant Structures

1. Spillway

The spillway, spillway outlet channel and the stilling basin are all in good condition. The spillway is a broad crested weir with a length of 65 feet. The concrete surface of the slabs, weir and abutment walls have been recently (1974) gunited and have a good appearance. The stilling basin is a recent improvement to the spillway and outlet facilities and is in excellent condition.

The spillway approach channel is about 2 to 3 feet deep and is clear. The approach is paved for a distance of 29 feet upstream from the overflow, then is composed of cobbles and stones into the reservoir area.

The outlet channel, below the stilling basin is riprapped on the slopes with a rock bottom to the natural stream channel about 150 feet downstream. The channel is not obstructed.

2. Outlet Structure

The outlet control for this dam consists of several valves contained in a valve house located at the downstream toe of the embankment. A 24-inch diameter pipe is carried from the upstream toe of the embankment, within the reservoir, through the embankment area and into the valve house. This pipe is encased in concrete but there is no upstream control. The controls in the valve house include three valves; two 24-inch and one 10-inch. The 10-inch valve is located on a tee connection between the two 24-inch valves and serves as a bypass feature to provide low flow control downstream when required. The upstream 24-inch valve is normally open and the downstream 24-inch valve is operated as desired. The valves were opened for this inspection. They are maintained in good condition.

Outlet from the valve house is through the 10-inch pipe to the outlet channel and through the 24-inch pipe to the outlet channel. The 24-inch pipe has a stone and concrete end wall at its terminis at the outlet channel. The 10-inch pipe discharges into the channel to the

left of the 24-inch endwall adjacent to the previously mentioned 8-inch pipe which conveys the seepage from the toe of the embankment to this same location.

The outlet structure is judged to be in good operating condition.

D. Reservoir Area

The Minersville Dam No.4 is located in a mountainous area. The terrain surrounding the reservoir is heavily wooded. All adjacent land appears to be stable with minimal chance of erosion.

E. Downstream Channel

The downstream channel is a natural stream with wooded and brush covered overbanks. The water course, known as Dyer Run, joins the Schuylkill River about 2 miles downstream from the dam. The intake for the Minersville water supply is a small reservoir situated about 1.8 miles downstream from this dam on Dyer Run.

Within the limits of the water course, from the dam to its confluence with the Schuylkill River, there are several residences within the flood plain. It is considered that a dam failure would endanger more than a few lives and therefore, the hazard category is "High" for this facility.

3.2 EVALUATION

The observed condition of this facility is good. All control features are in operable condition and the seepage condition appears to be under satisfactory control. There is no evidence of distress on the embankment, its slopes, abutments or beyond the toe. The spillway and its outlet, including the stilling basin and outlet channel, are in good repair. There is no means for closing the upstream end of the 24-inch outlet pipe. Consideration should be given to developing a procedure for closing this pipe in the event of an emergency.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

The Minersville Dam No.4 is a water supply facility for the Borough of Minersville. It is used in conjunction with a smaller reservoir located about 1.8 miles downstream on Dyer Run. On an as-needed basis, the water from Dam No.4 is released to the natural stream channel where it flows to the lower reservoir and is subsequently conveyed to the Borough for use.

The dam is attended on a regular basis, at least once each week. The owners representative indicated that the 24-inch outlet pipe is opened regularly and is opened specifically during heavy rainstorms for safety purposes.

The 10-inch valve for low flow control is partially opened at all times.

4.2 MAINTENANCE OF DAM

The dam embankment has rock slopes and does not require much maintenance. Weed growth is controlled and the area is kept in good repair.

4.3 MAINTENANCE OF OPERATING FACILITIES

The valve house contains the controls for discharge of the outlet. The valves in this structure are greased regularly, are operated frequently and are in good condition.

4.4 WARNING SYSTEM

There is no formal warning system in operation for this facility.

4.5 EVALUATION

The present maintenance and operation of this dam is considered to be good. The visual inspection observed a well maintained facility and indicated that the owner is concerned with safe operation of the dam. A formal surveillance and downstream warning system should be developed for implementation during periods of high or prolonged precipitation.

SECTION 5 - HYDROLOGY/HYDRAULICS

5.1 EVALUATION OF FEATURES

A. Design Data

Very little information was available on the hydrologic and hydraulic design of the dam. There were no area-capacity curves, frequency curves, unit hydrographs, design storm data, design flood hydrographs, flood routings nor spillway rating curves.

B. Experience Data

The flood of June 22, 1972 destroyed the lower two-thirds of the spillway chute. The chute was rebuilt with a new configuration, including a 12-foot drop structure, in 1974. Calculations based on records for a nearby USGS gaging station indicate that the peak inflow for the 1972 flood was probably about 630 cfs.

C. Visual Observations

On the date of the inspection, no conditions were observed that would indicate that the appurtenant structures of the dam could not operate satisfactorily during a flood event, until the dam is overtopped.

D. Overtopping Potential

Minersville Dam No.4 has a total storage capacity of 324 acre-feet and an overall height of 37 feet above streambed, both referenced to the top of the dam. These dimensions indicate a size classification of "Small". The hazard classification is "High" (see Section 3.1.E).

The recommended Spillway Design Flood (SDF) for a dam having the above classifications is from one-half the Probable Maximum Flood (PMF) to the full PMF. For this dam, the PMF peak inflow is 4,995 cfs (see Appendix C for HEC-1 inflow computations).

Comparison of the estimated PMF peak inflow of 4,995 cfs with the estimated spillway discharge capacity of 2,270 cfs indicates that a potential for overtopping of the Minersville Dam No.4 exists.

An estimate of the storage effect of the reservoir and routing of the computed inflow hydrograph through the reservoir shows that this dam does not have the necessary storage available to pass one-half the PMF without overtopping. The spillway-reservoir system can pass a flood event equal to 47 percent of the PMF.

E. Spillway Adequacy

The small size category and high hazard category, in accordance with the Corps of Engineers criteria and guidelines, indicates that the Spillway Design Flood (SDF) for this dam should be one-half the Probable Maximum Flood (PMF) to the full PMF.

The calculations show that the spillway discharge capacity and reservoir storage capacity combine to handle 47% of the (PMF) without overtopping the dam (refer to Sheet 6, Appendix C). These calculations have considered the existing profile along the embankment crest.

Being an earth embankment dam, it is judged that a breach is likely to develop when the depth of flow over the crest is 0.5 foot or greater. These studies also indicate that the depth of flow over the crest of the embankment due to one-half PMF is less than 0.5 foot. On the basis of this information, it is judged that a one-half PMF will cause some overtopping of the embankment but not enough to cause a breach. Therefore, the spillway capacity is considered to be inadequate, but not seriously inadequate.

It is to be noted that all computer calculations have used the USGS elevations which equals the project datum plus 25 feet. This was necessary to accommodate the elevations of the cross sections used for routing purposes.

The hydrologic analysis for this investigation was based upon existing conditions of the watershed. The effects of future development were not considered.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

A. Visual Observations

1. Embankment

The visual inspection of the embankment did not observe any signs of embankment instability. The downstream slope at 1.5H to 1V is a normally stable slope for dumped rock. Drainage characteristics are good and there was no observed seepage from the slope surface. The upstream slope, although not visible below the water surface appears to be stable. Design plans indicate a 3H to 1V and 3.5H to 1V slope ratios which are also considered adequate. Significant depressions were not observed along the crest of the dam. The surveyed profile along the crest showed a variation of 0.1 foot. This does not threaten the stability.

The concrete core wall, which is founded on rock adds to the stability of the dam. The seepage at the toe of the downstream slope, while continuous, appears to be adequately controlled. Its location appears to be in the vicinity of the original streambed under the dam. Another steadily discharging seepage location, about 50 feet downstream from the toe of the embankment, may originate from the reservoir. Its location is sufficiently far enough from the embankment so as not to be considered detrimental to the embankment stability.

2. Appurtenant Structures

The appurtenant structures for this dam include the spillway, and the 24-inch concrete encased pipe and a valve house. The spillway, spillway outlet channel and stilling basin are in good repair. Recent guniting of the concrete walls and slopes provide a reasonably smooth unobstructed flow path. Visual observations indicate a stable structure. The stilling basin contains energy dissipation blocks and will provide protection of the downstream channel.

The 24-inch outlet pipe is indicated as being encased in concrete and although not observed, is apparently in good condition. The outlet discharge is controlled in the valve house at the downstream toe of the embankment. All valves are operable and appear to be in good condition. There is no upstream control on this pipe.

B. Design and Construction Data

Design or construction data were not available in the files. The 1974 repairs and modification contract documents are available in

the owner's file and indicate standard engineering procedures were used for this work. The judgement regarding the stability of the units in this dam are based upon the visual appearance, historic correspondence and post construction inspection reports.

C. Operating Records

There are no formal operating records on file to judge the performance of the dam during periods of high flow.

The owner indicated that the blowoff line is opened during periods of heavy or prolonged rains.

D. Post Construction Changes

Since 1912, this dam underwent one major change in 1928, and repairs in 1974, improvements were made to the spillway and spillway outlet facilities. The 1928 modification enlarged the embankment and relocated the spillway to the left abutment. The 1974 work repaired the eroded outlet channel and added a drop structure type stilling basin at the end of the spillway outlet channel.

Concern over maintaining sufficient water in reserve supply has been constant at this dam. The use of 12-inch high flashboards was permitted by PennDER in 1933 and renewed in 1935 for an additional two years. The records show that the flashboards have been used beyond the 1937 period from time to time. Usually they were placed on the crest of the spillway during periods of prolonged dry weather.

E. Seismic Stability

This dam is located in Seismic Zone 1 and it is considered that the static stability is sufficient to withstand minor earthquake induced dynamic forces. No studies or calculations have been made to confirm this assumption.

SECTION 7 - ASSESSMENT AND RECOMMENDATIONS

7.1 DAM ASSESSMENT

A. Safety

The visual inspection, the review of available design data and the operational history of this dam indicate that this dam is in good condition.

The hydrologic and hydraulic computations indicate that this facility has the capacity for passing 47 percent of the PMF without overtopping the dam. The guidelines of the Corps of Engineers requires 50 percent of PMF capacity without causing an overtopping failure as a minimum condition. The calculations show that the overtopping flow due to a 50 percent PMF flow is not enough to consider failure and therefore, the spillway while inadequate, is not considered to be seriously inadequate.

The embankment, spillway and outlet channel did not show any evidence of distress. The seepage from the toe of the embankment, while steady, was clear and under control.

B. Adequacy of Information

The information available in the PennDER files and from the owner, together with the observed conditions at the site are considered sufficiently adequate for making a reasonable assessment of this facility.

C. Urgency

The recommendations presented as a result of this inspection should be implemented without delay.

D. Necessity for Additional Studies

A detailed hydrologic and hydraulic analysis is required, with necessary recommendations to improve the capacity of the reservoir and spillway to at least 50 percent of PMF.

7.2 RECOMMENDATIONS

In order to assure a continued satisfactory operation of this dam, the following recommendations should be implemented by the owner.

A. Facilities

1. Observe and record the seepage discharge from the toe of the embankment on a regular basis. Note clarity of water and flow rate. If color appears or if flow increases, take immediate steps to determine cause and implement remedial action.

2. Implement a detailed hydrologic and hydraulic analysis to determine methods of improving the storage and spillway capacity.

3. Develop a means for positive cutoff or closure of the upstream end of the 24-inch pipe in the event of an emergency.

B. Operation and Maintenance procedures

1. Continue the present operational and maintenance procedures regarding control of growth on the embankment slopes and the lubrication and operation of the valves in the valve house.

2. Develop and implement a formal surveillance and downstream warning system to be used during periods of high or prolonged rainfall or during other emergency conditions.

APPENDIX A

CHECKLIST OF VISUAL INSPECTION REPORT

CHECK LIST

PHASE I - VISUAL INSPECTION REPORT

PA DER # 54-39 NDI NO. PA-00 675

NAME OF DAM Minersville Reservoir No.4 HAZARD CATEGORY High

TYPE OF DAM Earthfill - Concrete Core

LOCATION Cass TOWNSHIP Schuylkill COUNTY, PENNSYLVANIA

INSPECTION DATE 11/2/78 WEATHER Sunny - Cool TEMPERATURE 40°- 50°F

INSPECTORS: R. Houseal (Recorder) OWNER'S REPRESENTATIVE(s):

A. Bartlett Harry Martz

D. Remmel

R. Steacy

NORMAL POOL ELEVATION: 1430.2 AT TIME OF INSPECTION:

BREAST ELEVATION: 1435 Spillway Elevation POOL ELEVATION: 1430.2

SPILLWAY ELEVATION: 1430.2 TAILWATER ELEVATION: --

MAXIMUM RECORDED POOL ELEVATION: 1434 (1972)

GENERAL COMMENTS:

General appearance of the dam is good.
Maintenance of embankment minimal due to rock cover.

NDI NO. PA-00 675

VISUAL INSPECTION
EMBANKMENT

	OBSERVATIONS AND REMARKS
A. SURFACE CRACKS	None evident.
B. UNUSUAL MOVEMENT BEYOND TOE	None evident.
C. SLOUGHING OR EROSION OF EMBANKMENT OR ABUTMENT SLOPES	None evident.
D. ALIGNMENT OF CREST: HORIZONTAL: VERTICAL:	Horizontal alignment - good. Vertical alignment - good.
E. RIPRAP FAILURES	None.
F. JUNCTION EMBANKMENT & ABUTMENT OR SPILLWAY	All junctions good.
G. SEEPAGE	Collects at one low point and drains to outlet channel via 8-inch pipe Seepage beyond toe to right of outlet house could be a spring.
H. DRAINS	8-inch pipe from collection at toe of downstream slope to outlet channel.
J. GAGES & RECORDER	None.
K. COVER (GROWTH)	Downstream conglomerate dumped rock. Top - gravel surface - good condition. Upstream sand and gravel over dumped rock to waters edge.

NDI NO. PA-00 675

VISUAL INSPECTION
OUTLET WORKS

	OBSERVATIONS AND REMARKS
A. INTAKE STRUCTURE	Submerged not visible.
B. OUTLET STRUCTURE	24-inch pipe, valve control house - good condition. Outlet rectangular box from 24-inch pipe.
C. OUTLET CHANNEL	Short concrete apron. Rock lined channel
D. GATES	Two 24-inch gates. One 10-inch gate.
E. EMERGENCY GATE	24-inch pipe.
F. OPERATION & CONTROL	Well greased valves - used to drawdown reservoir for spillway renovations in 1974, used to release water to downstream reservoir in times of water supply shortage.
G. BRIDGE (ACCESS)	Can drive to valve control house across breast of dam and down along spillway.

NDI NO. PA-00675

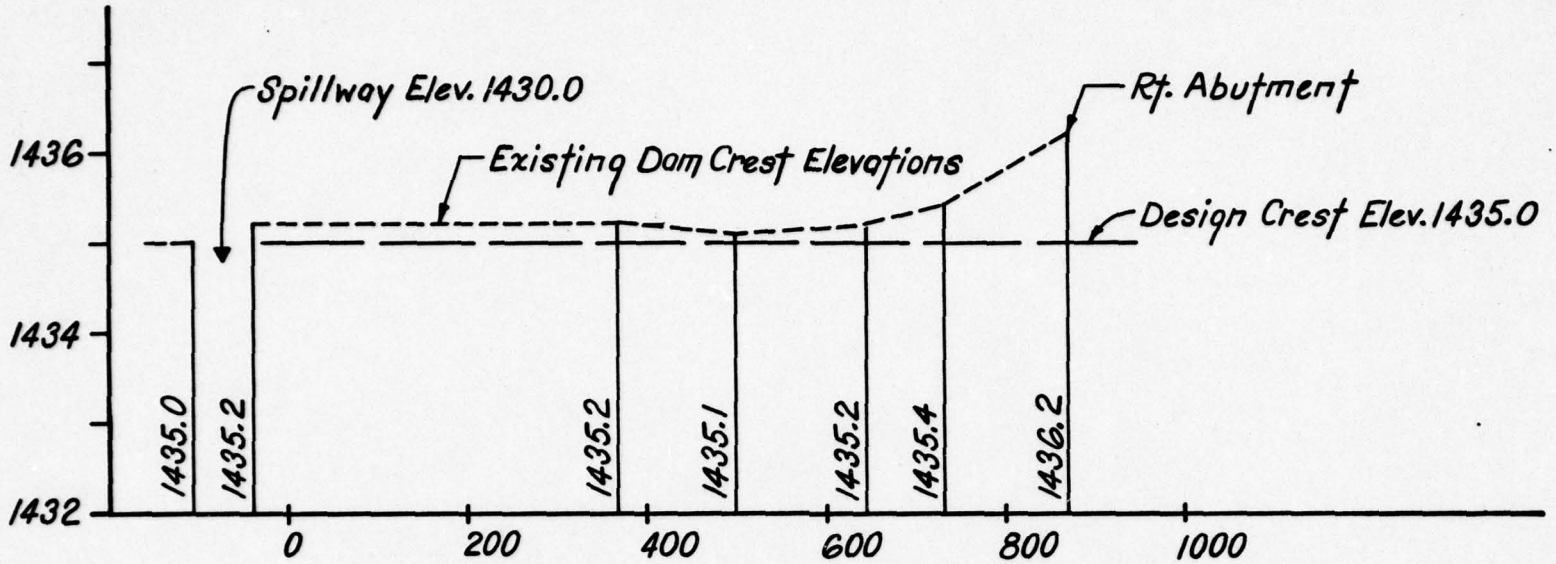
VISUAL INSPECTION
SPILLWAY

	OBSERVATIONS AND REMARKS
A. APPROACH CHANNEL	2 to 3 feet deep. 1 to 3 inch cobbles, some silt, leaves, moss, no debris. Bottom covered with gunnite to 25 feet upstream above crest.
B. WEIR: Crest Condition Cracks Deterioration Foundation Abutments	Broad crested, good condition, no cracks. 1972 storm caused a lot of deterioration to spillway and abutments, since then everything has been gunnited and appears to be in excellent condition (1974).
C. DISCHARGE CHANNEL: Lining Cracks Stilling Basin	Good condition, no cracks, also gunnited in 1974. Stilling basin: drop structure with energy dissipators.
D. BRIDGE & PIERS	None.
E. GATES & OPERATION EQUIPMENT	None.
F. CONTROL & HISTORY	1972 storm - 3-1/2 to 4 feet over spillway, was overtopping left sidewall.

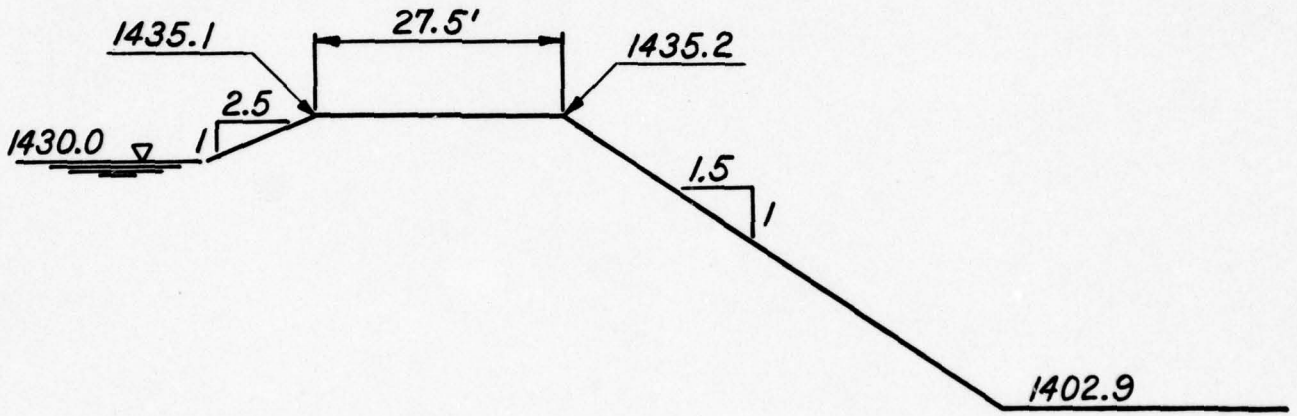
NDI NO. PA-00675

VISUAL INSPECTION

	OBSERVATIONS AND REMARKS
INSTRUMENTATION	
Monumentation	None.
Observation Wells	None.
Weirs	None.
Piezometers	None.
Staff Gauge	None.
Other	None.
RESERVOIR	
Slopes	Forested.
Sedimentation	Little or none. No record of problems.
Watershed Description	Wooded, small trees and scrub. Mountain terrain.
DOWNSTREAM CHANNEL	
Condition	Mostly rock lined.
Slopes	Fairly steep, see USGS quad. wooded.
Approximate Population	More than a few.
No. Homes	Several residences in floodplain.



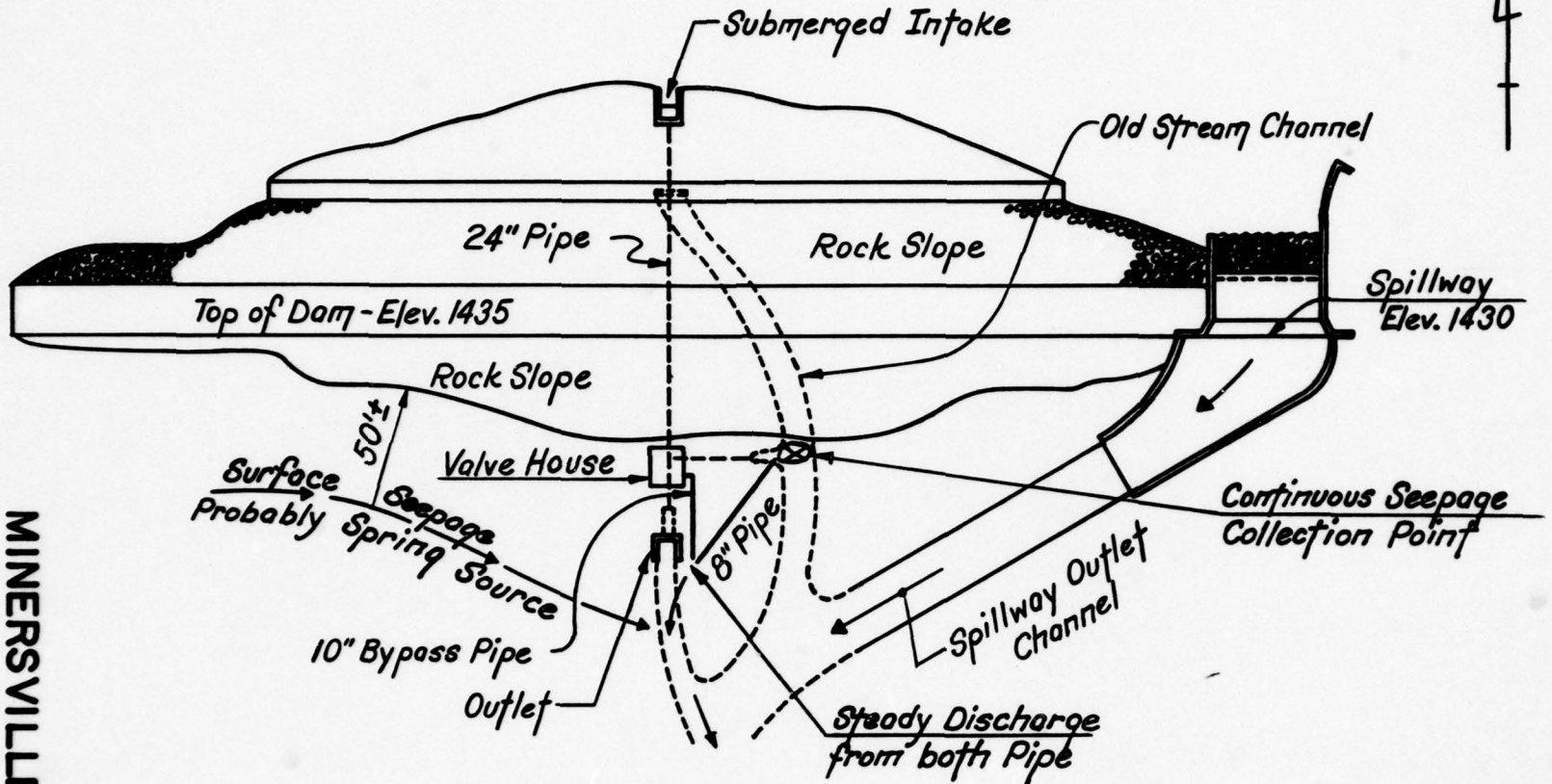
EMBANKMENT PROFILE



EMBANKMENT SECTION

Surveyed 11/2/78

MINERSVILLE DAM No. 4
PA. 675
INSPECTION SURVEY
PLATE A-I



PLAN

MINERSVILLE DAM No. 4

MINERSVILLE DAM No.4
PA.675
INSPECTION SURVEY

PLATE A-II

Surveyed 11/2/78

APPENDIX B

CHECKLIST OF ENGINEERING DATA

CHECK LIST
ENGINEERING DATA

PA DER # 54-39 NDI NO. PA-00 675

NAME OF DAM MINERSVILLE RESERVOIR NO.4

ITEM	REMARKS
AS-BUILT DRAWINGS	Design drawings for 1928 modification and sketches for installation of flashboards 1931, 1933 and 1935.
REGIONAL VICINITY MAP	U.S.G.S. Quadrangle Map. See Plate II, Appendix F
CONSTRUCTION HISTORY	Correspondence and inspection reports.
GENERAL PLAN OF DAM	Design Plan of 1928 Modification. Plate III, Appendix F.
TYPICAL SECTIONS OF DAM	Design Sections of 1928 Modifications. Plate IV, Appendix F.
OUTLETS: PLAN DETAILS CONSTRAINTS DISCHARGE RATINGS	1928 Plans for modifying the dam includes a section of the outlet facility. There is no rating data for discharge.

NDI NO. PA-00 675

ENGINEERING DATA

ITEM	REMARKS
RAINFALL & RESERVOIR RECORDS	None.
DESIGN REPORTS	None - application for permit review describes the project.
GEOLOGY REPORTS	None.
DESIGN COMPUTATIONS: HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None.
MATERIALS INVESTIGATIONS: BORING RECORDS LABORATORY FIELD	None.
POST CONSTRUCTION SURVEYS OF DAM	Inspection reports and correspondence.
BORROW SOURCES	Unknown.

NDI NO. PA-00 675

ENGINEERING DATA

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	1914 - raised embankment core wall. 1928 - completely revised dam and spillway layout.
HIGH POOL RECORDS	By recollection - 1972 (Agnes) Spillway + 3-1/2 to 4 feet. No other records.
POST CONSTRUCTION ENGINEERING STUDIES & REPORTS	Inspection Reports and Correspondence.
PRIOR ACCIDENTS OR FAILURE OF DAM Description: Reports:	None.
MAINTENANCE & OPERATION RECORDS	None.
SPILLWAY PLAN, SECTIONS AND DETAILS	1928 plans for modifications to the dam.

NDI NO. PA-00 675

ENGINEERING DATA

ITEM	REMARKS
OPERATING EQUIPMENT, PLANS & DETAILS	Minimal details on 1928 plans.
CONSTRUCTION RECORDS	Inspection reports and correspondence from 1914.
PREVIOUS INSPECTION REPORTS & DEFICIENCIES	Inspection reports and correspondence from 1914.
MISCELLANEOUS	

NDI NO. PA-00 675

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Woodland, Mountainous

ELEVATION:

TOP NORMAL POOL & STORAGE CAPACITY: Elev. 1430.2 196 Acre-Feet

TOP FLOOD CONTROL POOL & STORAGE CAPACITY: Elev. 1435 324 Acre-Feet

MAXIMUM DESIGN POOL: Elev. 1435

TOP DAM: Elev. 1435

SPILLWAY:

a. Elevation 1430.2

b. Type Broad crested weir.

c. Width 29 feet.

d. Length 65 feet.

e. Location Spillover Left abutment.

f. Number and Type of Gates None.

OUTLET WORKS:

a. Type 24-inch C.I. Pipe.

b. Location Near center of embankment.

c. Entrance inverts Elev. 1403.

d. Exit inverts 1401

e. Emergency drawdown facilities 24-inch pipe.

HYDROMETEOROLOGICAL GAGES:

a. Type None

b. Location N/A

c. Records N/A

MAXIMUM NON-DAMAGING DISCHARGE: Unknown

APPENDIX C

HYDROLOGY AND HYDRAULIC CALCULATIONS

SUMMARY DESCRIPTION
OF
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION

The hydrologic and hydraulic evaluation for this inspection report has employed computer techniques using the Corps of Engineers computer program identified as the Flood Hydrograph Package (HEC-1) Dam Safety Version.

The program has been designed to enable the user to perform two basic types of hydrologic analyses: (1) the evaluation of the overtopping potential of the dam, and (2) the capability to estimate the downstream hydrologic-hydraulic consequences resulting from assumed structural failures of the dam. A brief summary of the computation procedures typically used in the dam overtopping analysis is shown below.

- Development of an inflow hydrograph to the reservoir.
- Routing of the inflow hydrograph(s) through the reservoir to determine if the event(s) analyzed would overtop the dam.
- Routing of the outflow hydrograph(s) of the reservoir to desired downstream locations. The results provide the peak discharge, time of the peak discharge and maximum stage of each routed hydrograph at the outlet of the reach.

The output data provided by this program permits the comparison of downstream conditions just prior to a breach failure with that after a breach failure and the determination as to whether or not there is a significant increase in the hazard to loss of life as a result of such a failure.

The results of the studies conducted for this report are presented in Section 5.

For detailed information regarding this program refer to the Users Manual for the Flood Hydrograph Package (HEC-1) Dam Safety Version prepared by the Hydrologic Engineering Center, U. S. Army Corps of Engineers, Davis, California.

COMPUTED BY _____ DATE _____ CHECKED BY _____

Spillway Rating

Pool at top of dam

Orig. crest = 1430'
Add 0.2 for Shotcrete

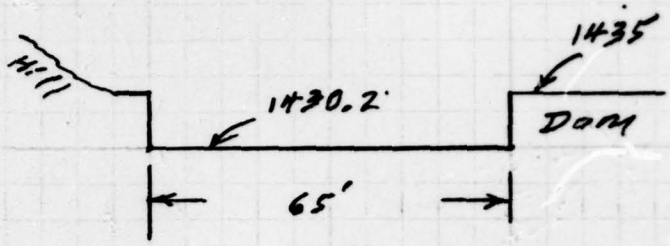
$L = 65$ feet

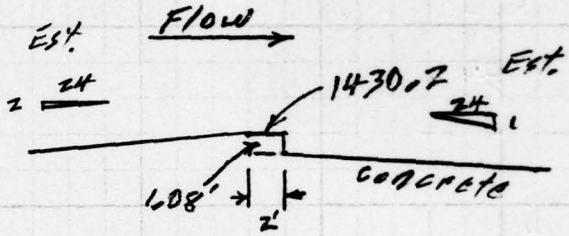
$H = 1435 - 1430.2 = 4.8$

$Q = CLH^{3/2}$

$= 3.32 \times 65 \times (4.8)^{3/2}$

$= 2270$ cfs





Use C = 3.32
Table 5-3 Brater + King

Max Known Flood

USGS gaging station at Ringtown
Drainage Area 1.77
Max flood 1959-1978 = 487 cfs 6-22-72
Minersville Reservoir drainage area 2.43

$$\left(\frac{2.43}{1.77}\right)^{0.8} \times 487 = 630 \text{ cfs}$$

24" Outlet pipe, 220 ft long

Elev. upstr end invert 1403
Est downstr invert 1401

Pool at 1405 $h = 1405 - 1402 = 3$

$$h = 3 = K_i \frac{V^2}{2g} + 2.87\, n^2 \frac{220 V^2}{d^{4/3}}$$

$$3 = 0.5 \frac{V^2}{64.3} + 2.87 (0.015)^2 \frac{220 V^2}{2^{1.33}}$$

$$3 = 0.0078 V^2 + 0.000646 \times 87.51 V^2$$

COMPUTED BY KLS DATE 11-6-18 CHECKED BY JJ 11-20-18

24" Outlet pipe (cont.)

$$3 = V^2(0.0078 + 0.0565)$$

$$V^2 = \frac{3}{0.0643} = 46.66$$

$$V = 6.83 \text{ ft/sec}$$

$$Q = VA = 6.83 \times \pi R^2 = 21 \text{ cfs}$$

Pool at 1430.2 $h = 1430.2 - 1402$

$= 28.2$ ft.

$$V^2 = \frac{28.2}{0.0643} = 439$$

$$V = 20.9$$

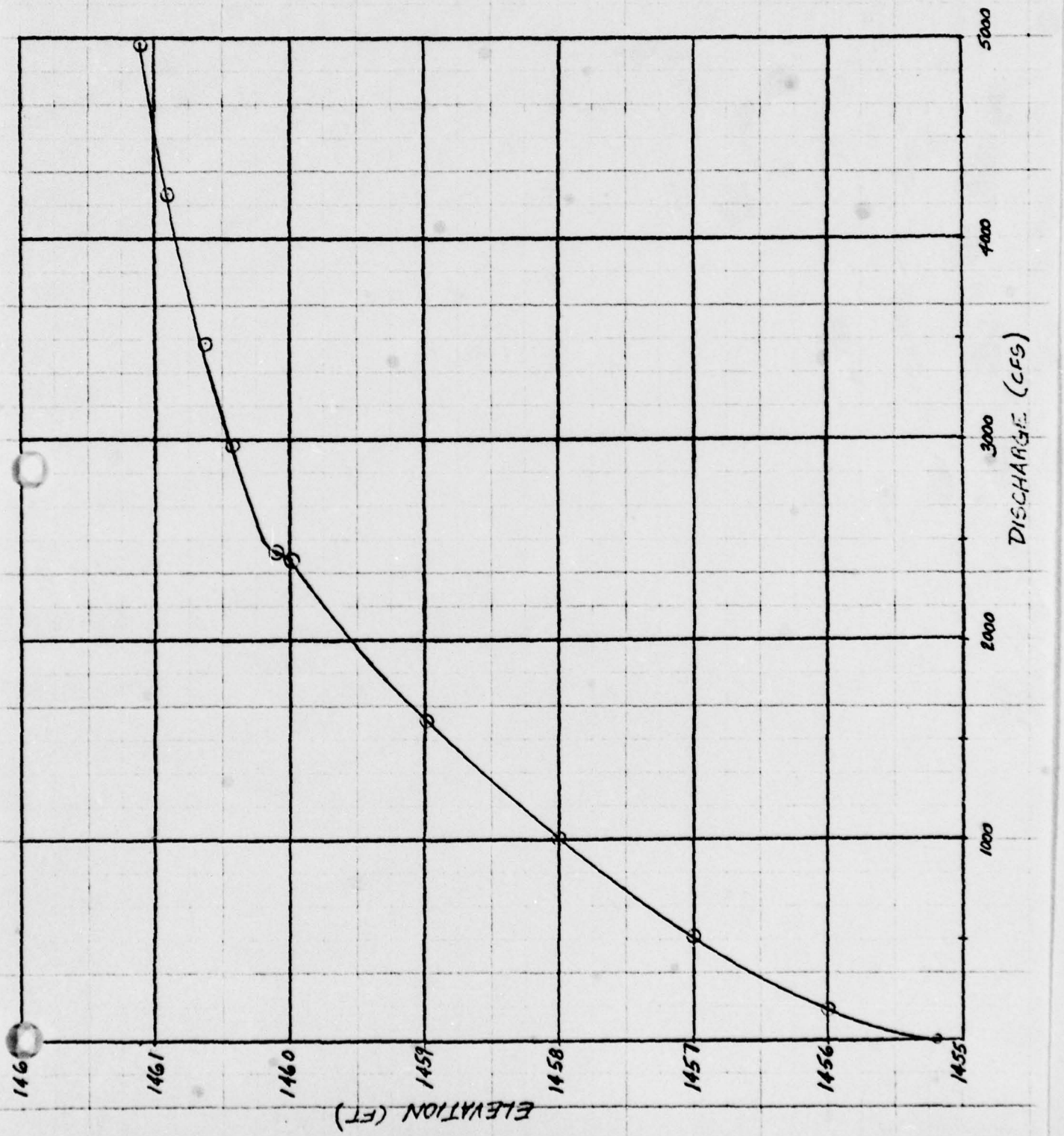
$$Q = VA = 20.9 \times \pi = 66 \text{ cfs}$$

BY DJR DATE 1/16/79 **BERGER ASSOCIATES** SHEET NO. 3 OF 6

CHKD. BY DATE PROJECT DB490

SUBJECT MINERSVILLE DAM NO. 4

SPILLWAY AND EMBANKMENT RATING CURVE



BY DJR DATE 1/24/79 BERGER ASSOCIATES SHEET NO. 4 OF 6
CHKD. BY DATE PROJECT D8490
SUBJECT MINERSVILLE DAM NO. 4

SIZE CLASSIFICATION

Maximum Storage = 324 acre-feet
Maximum Height = 33 feet
Size Classification is "SMALL"

HAZARD CLASSIFICATION

Several houses are located within the floodplain about 1.5 miles downstream from the dam. use "HIGH"

RECOMMENDED SPILLWAY DESIGN FLOOD (SDF)

The above classifications indicate the use of an SDF from 1/2 the Probable Maximum FLOOD (PMF) to the full PMF

BY DJR DATE 11/24/79 BERGER ASSOCIATES SHEET NO. 5 OF 6
CHKD. BY DATE PROJECT D8490
SUBJECT MINERSVILLE DAM NO. 4

HEC-1 DATA

DRAINAGE AREA = 2.43 SQ. MI.

DELAWARE BASIN REGION 6

$C_p = .40$

$C_T = 1.35$

Longest water course, $L = 2.35$ mi

Length to centroid, $L_{CA} = 1.061$ mi

$$T_p = C_T (L \times L_{CA})^{.3}$$

$T_p = 1.78$ hrs.

RAINFALL (HMA-33)

INDEX = 22.9"

Zone 6

Incremental Rainfall:

6 hr = 113%

12 hr = 123%

24 hr = 132%

48 hr = 142%

PLANIMETERED AREAS (FROM QUAD SHEET)

ELEV.: 1455.2 = 22 ACRES

1480 = 92 ACRES

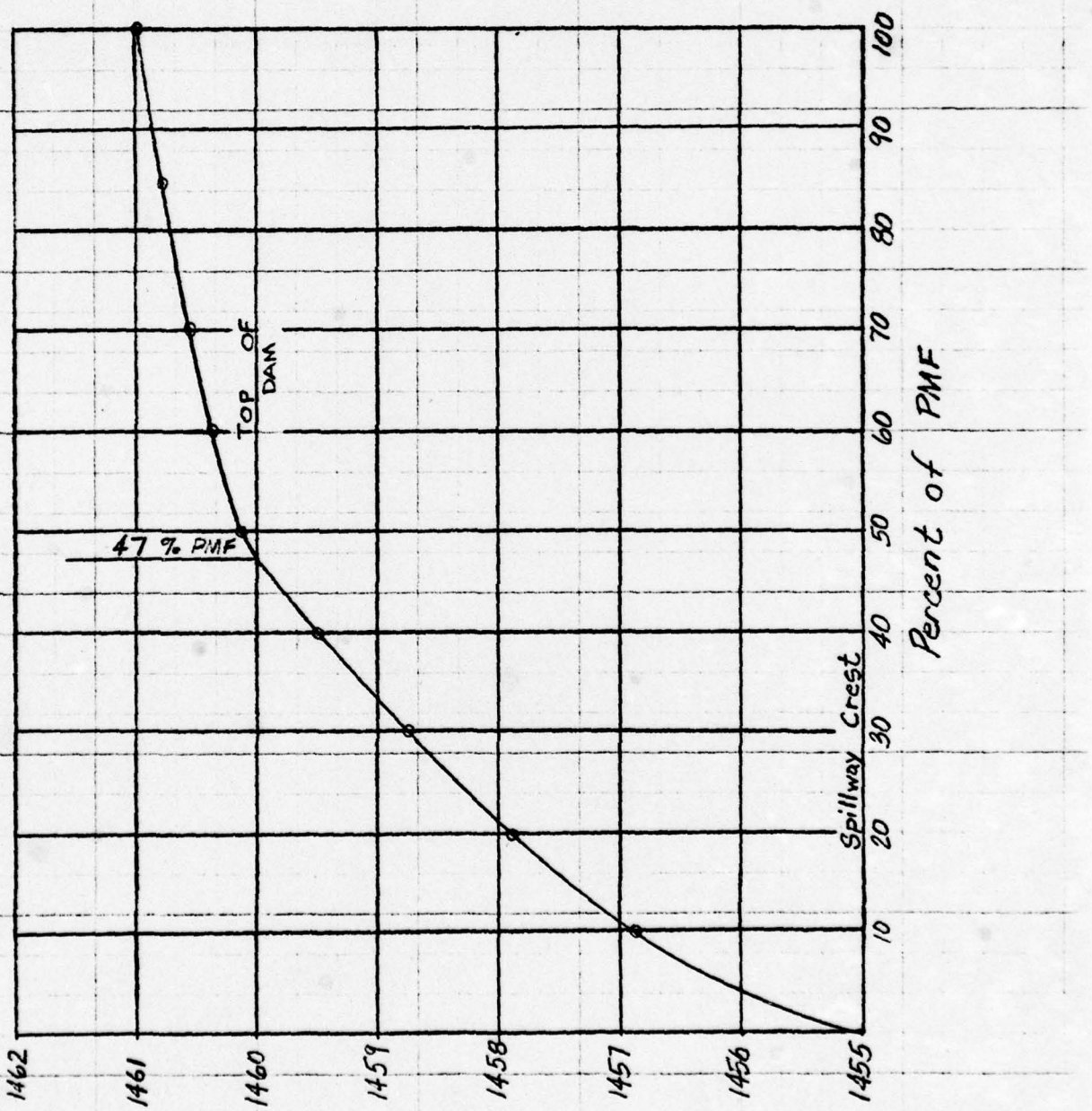
ZERO STORAGE ELEV.

ELEV = 1455.2 - (STORAGE x 3/AREA)

= 1428.5

BY DJR DATE 1/16/79 **BERGER ASSOCIATES** SHEET NO. 6 OF 6
CHKD. BY DATE PROJECT DB490
SUBJECT MINERSVILLE DAM NO. 4

SPILLWAY CAPACITY CURVE



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FLOOD HYDROGRAPH PACKAGE (HEC-1)                                    OVERTOPPING ANALYSIS   1/4
DAM SAFETY VERSION     JULY 1978
 LAST MODIFICATION  26 FEB 79
**********************************
    1          A1     MINERSVILLE DAM NO. 4 **** DYER RUN
    2          A2     CASS TWP., SCHUYLKILL COUNTY
    3          A3     NDI # PA-00675   PA DER # 54-39
    4          B   300     0    15     0     0     0     0     0    -4     0
    5          B1    5
    6          J     1     9     1
    7          J1    1   .85    .7    .6    .5    .4    .3    .2    .1
    8          K               1                                 1
    9          K1                INFLOW HYDROGRAPH
   10          M     1     1  2.43
   11          P          22.9   113   123   132   143
   12          T                                               1   .05
   13          W  1.78    .4
   14          X  -1.5   -.05     2
   15          K     1     2                                     1
   16          K1                RESERVOIR ROUTING
   17          Y                             1     0
   18          Y1    1                                       196
   19          $A    0    22    92
   20          $E1428.5 1455.2  1480
   21          $$1455.2    65  3.32   1.5
   22          $D 1460   2.7   1.5   760
   23          K    99

1                    PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                                RUNOFF HYDROGRAPH AT        1
                                ROUTE HYDROGRAPH TO         2
                                END OF NETWORK

1**********************************
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  26 FEB 79
 **********************************

 RUN  DATE# 79/03/28.
      TIME# 05.49.59.

                    MINERSVILLE DAM NO. 4 **** DYER RUN
                    CASS TWP., SCHUYLKILL COUNTY
                    NDI # PA-00675   PA DER # 54-39

                                JOB SPECIFICATION
                    NQ     NHR    NMIN    IDAY     IHR    IMIN   METRC    IPLT   IPRT   NSTAN
                    300      0      15       0       0       0       0       0     -4       0
                                          JOPER     NWT   LROPT   TRACE
                                             5       0       0       0

                                MULTI-PLAN ANALYSES TO BE PERFORMED
                                                NPLAN= 1 NRTIO= 9 LRTIO= 1
                    RTIOS=  1.00   .85    .70    .60    .50    .40    .30    .20    .10
```

MINERSVILLE DAM NO. 4 #### DYER RUN
CASS TWP., SCHUYLKILL COUNTY
NDI # PA-00675 PA DER # 54-39

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	15	0	0	0	0	0	4	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 9 LRTIO= 1

RTIOS= 1.00 .85 .70 .60 .50 .40 .30 .20 .10

########## ########## ########## ########## ##########

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	2.43	0.00	2.43	0.00	0.000	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.90	113.00	123.00	132.00	143.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA
TP= 1.78 CP= .40 NTA= 0

RECESSION DATA
STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH 75 END-OF-PERIOD ORDINATES, LAG= 1.80 HOURS, CP= .40 VOL= 1.00

16.	58.	120.	191.	261.	316.	350.	354.	334.	310.
287.	267.	247.	229.	213.	197.	183.	170.	157.	146.
135.	125.	116.	108.	100.	93.	86.	80.	74.	69.
64.	59.	55.	51.	47.	44.	41.	38.	35.	32.
30.	28.	26.	24.	22.	21.	19.	18.	16.	15.
14.	13.	12.	11.	10.	10.	9.	8.	8.	7.
7.	6.	6.	5.	5.	5.	4.	4.	4.	3.
3.	3.	3.	2.	2.					

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	26.20	23.79	2.41	149383.
										(665.)	(604.)	(61.)	(4230.06)

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

RESERVOIR ROUTING

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	0	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	196.	0

SURFACE AREA=	0.	22.	92.
CAPACITY=	0.	196.	1510.
ELEVATION=	1429.	1455.	1480.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
1455.2	65.0	3.3	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1460.0	2.7	1.5	760.

PEAK OUTFLOW IS 4984. AT TIME 41.75 HOURS

PEAK OUTFLOW IS 4236. AT TIME 41.75 HOURS

PEAK OUTFLOW IS 3486. AT TIME 41.75 HOURS

PEAK OUTFLOW IS 2982. AT TIME 41.75 HOURS

PEAK OUTFLOW IS 2430. AT TIME 42.25 HOURS

PEAK OUTFLOW IS 1912. AT TIME 42.25 HOURS

PEAK OUTFLOW IS 1428. AT TIME 42.50 HOURS

PEAK OUTFLOW IS 947. AT TIME 42.50 HOURS

PEAK OUTFLOW IS 466. AT TIME 42.50 HOURS

********** ********** ********** ********** **********

1

1 ********** ********** ********** ********** **********

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

				RATIOS APPLIED TO FLOWS								
OPERATION	STATION	AREA	PLAN	RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6	RATIO 7	RATIO 8	RATIO 9
				1.00	.85	.70	.60	.50	.40	.30	.20	.10
HYDROGRAPH AT	1	2.43	1	4995.	4246.	3496.	2997.	2497.	1998.	1498.	999.	499.
	(	6.29)	(	141.44)(	120.22)(	99.01)(	84.86)(	70.72)(	56.57)(	42.43)(	28.29)(	14.14)
ROUTED TO	2	2.43	1	4984.	4236.	3486.	2982.	2430.	1912.	1428.	947.	466
	(	6.29)	(	141.13)(	119.94)(	98.72)(	84.44)(	68.82)(	54.13)(	40.45)(	26.82)(	13.19)

1 SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1455.20	1455.20	1460.00
STORAGE	196.	196.	324.
OUTFLOW	0.	0.	2269.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1460.98	.98	356.	4984.	5.75	41.75	0.00
.85	1460.77	.77	349.	4236.	4.75	41.75	0.00
.70	1460.54	.54	342.	3486.	3.75	41.75	0.00
.60	1460.36	.36	336.	2982.	2.75	41.75	0.00
.50	1460.11	.11	328.	2430.	1.50	42.25	0.00
.40	1459.48	0.00	308.	1912.	0.00	42.25	0.00
.30	1458.73	0.00	285.	1428.	0.00	42.50	0.00
.20	1457.88	0.00	262.	947.	0.00	42.50	0.00
.10	1456.87	0.00	235.	466.	0.00	42.50	0.00

1**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
****
EOI ENCOUNTERED.
N>

APPENDIX D

GEOLOGIC REPORT

GEOLOGIC REPORT

Bedrock - Dam and Reservoir

Formation Name: Mauch Chunk Formation, upper member.

Lithology: Gray conglomerate and conglomeratic sandstone composed of quartz and quartzite pebeles, quartz sand grains cemented with silica and clay minerals, interbedded with red sandstone, red siltstone and red shale.

Structure

The dam is located on the south flank of the Eisenhuth Run Anticline, a minor fold of the Southern Anthracite basin. The beds, just north of the dam strike N80°E and dip 11°S. Air photo fracture traces strike N10°E and N30°W.

Two thrust faults, essentially parallel to bedding cross the valley south of the dam. Cross faults are also mapped in the area.

Overburden

No core boring information is available for this dam. The dam was constructed with a core wall, and it is reported that in some places it was 20 to 30 feet to bedrock.

Aquifer Characteristics

While some of the sandstone units of the Mauch Chunk Formation may have some primary porosity and permeability, most, if not all, ground water movement is along bedding planes and fractures. Since the grains and cement of the rock are essentially insoluble minerals, there is little chance of decomposition of the rock by ground water movement.

Discussion

There was a leak through the bedrock noted shortly after completion of the dam in 1912. The leak was apparently stopped by grouting "surface rock" at the west end of the dam. In 1928 the embankment was raised five feet. After the dam was raised a small leak appeared near the toe of the dam, which has continued to the present.

It is not clear whether this leak is through the embankment or through the bedrock formation. Leakage through the bedrock below the core wall is a possibility, especially in view of the fractures making a high angle with the axis of the dam. The bedrock is considered sound, and decomposition due to leakage is considered unlikely.

The thrust faults and cross faults were active only at the time of folding of the rocks 275 to 300 million years ago. They are not active faults.

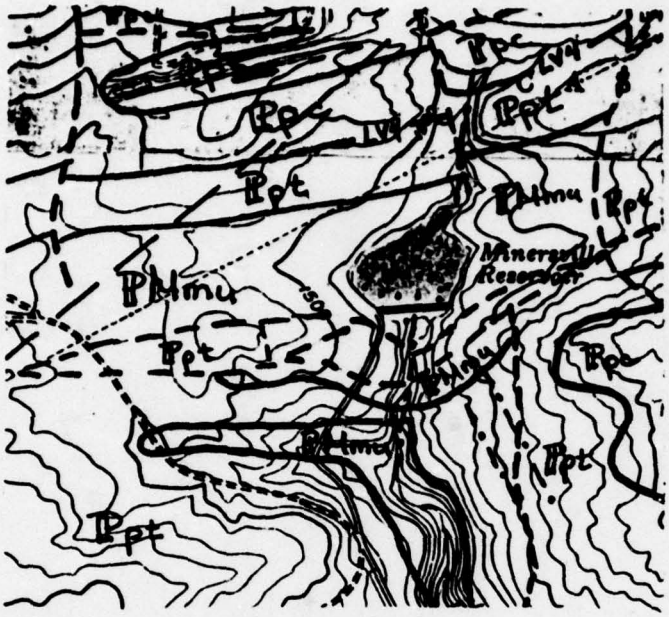
Sources of Information

1. Wood, G.H. and others. (1968) "Geologic Map of the Minersville Quadrangle, Schuylkill County, Pa." U.S. Geological Survey Map GQ 690.

2. Air photographs, dated 1969, scale 1:24,000.

3. Inspection reports in file.

GEOLOGIC MAP - Minersville Reservoir Dam



(geology from U.S.G.S. GQ-690 and GQ-918)

Pps	Pottsville Fm.- Sharp Mountain Member
Ppc	Pottsville Fm.- Schuylkill Member
Ppt	Pottsville Fm.- Tumbling Run Member
PMmu	Mauch Chunk Fm.- upper member
—LVY—	Lykens Valley #4 coal bed
— — —	fault
—.—.—	air photo fracture trace

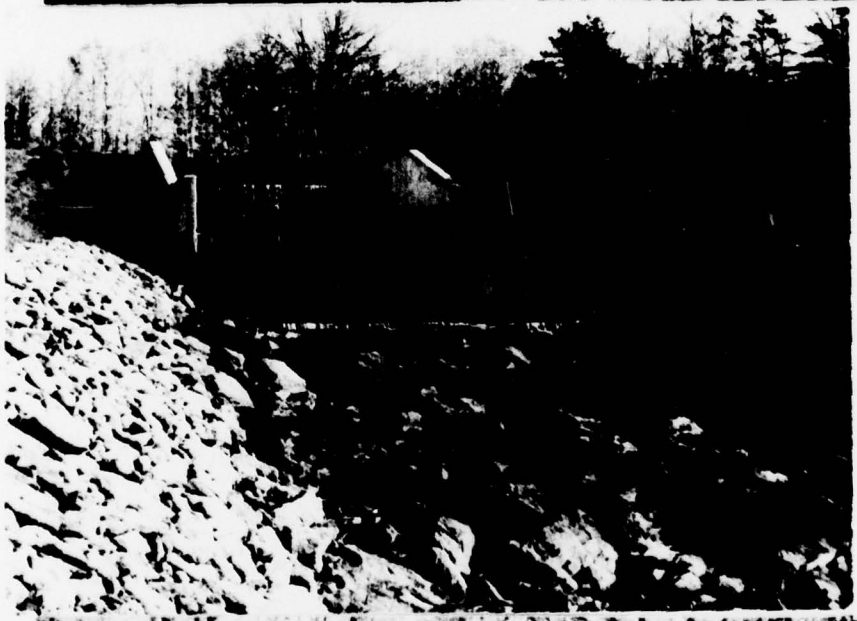
SCALE 1:24000

1 0 1 MILE

APPENDIX E

PHOTOGRAPHS

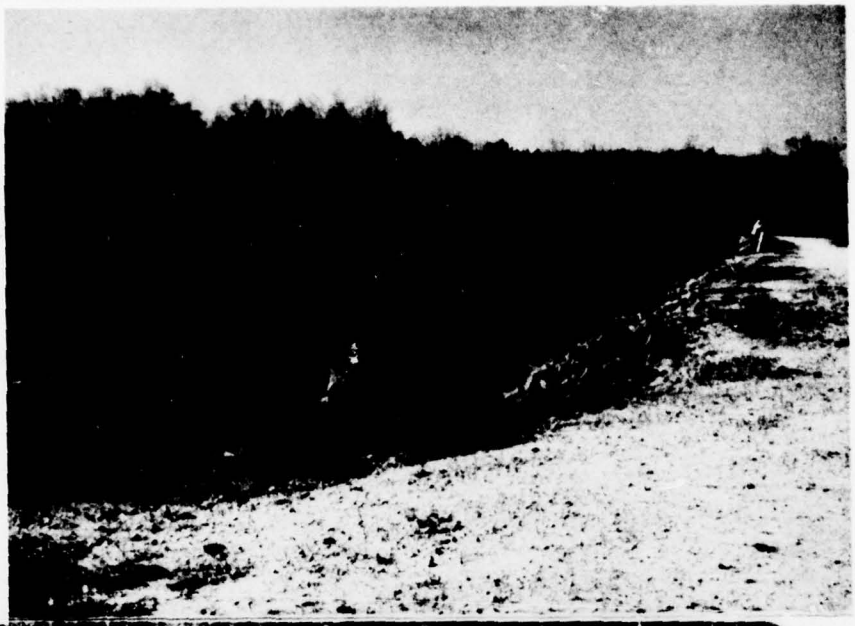
Spillway Crest



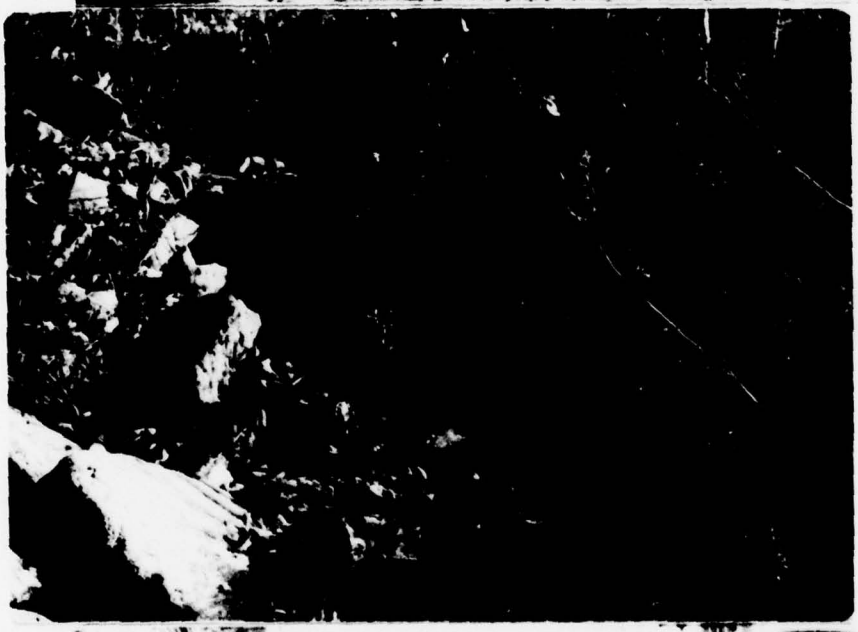
Drop Structure
Stilling Basin

Spillway Outlet
Channel

PA-675
PLATE E-I



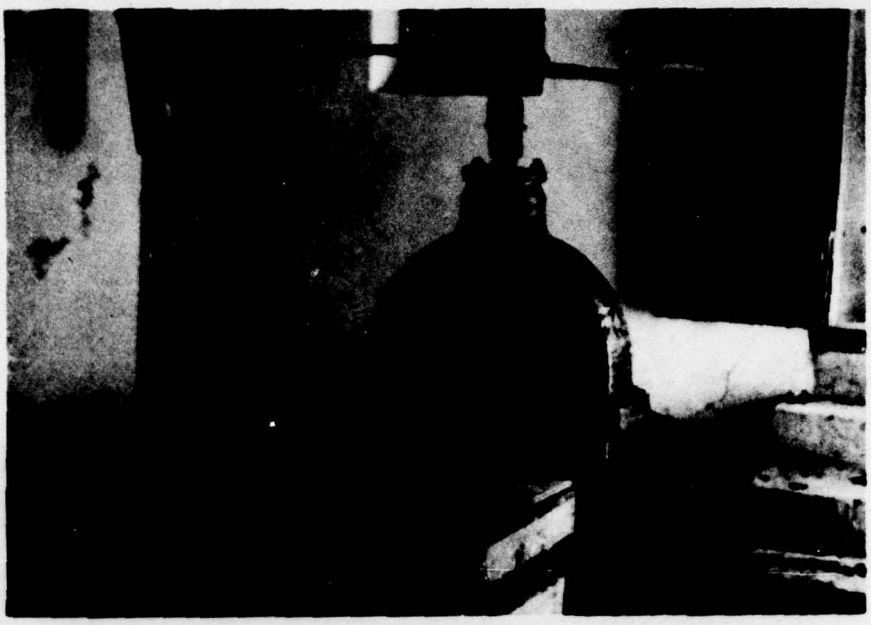
Downstream Slope
and
Valve House



Blowoff Outlet

Bypass & Toe
Drain Outlet
Pipes

PA-675
PLATE E-11



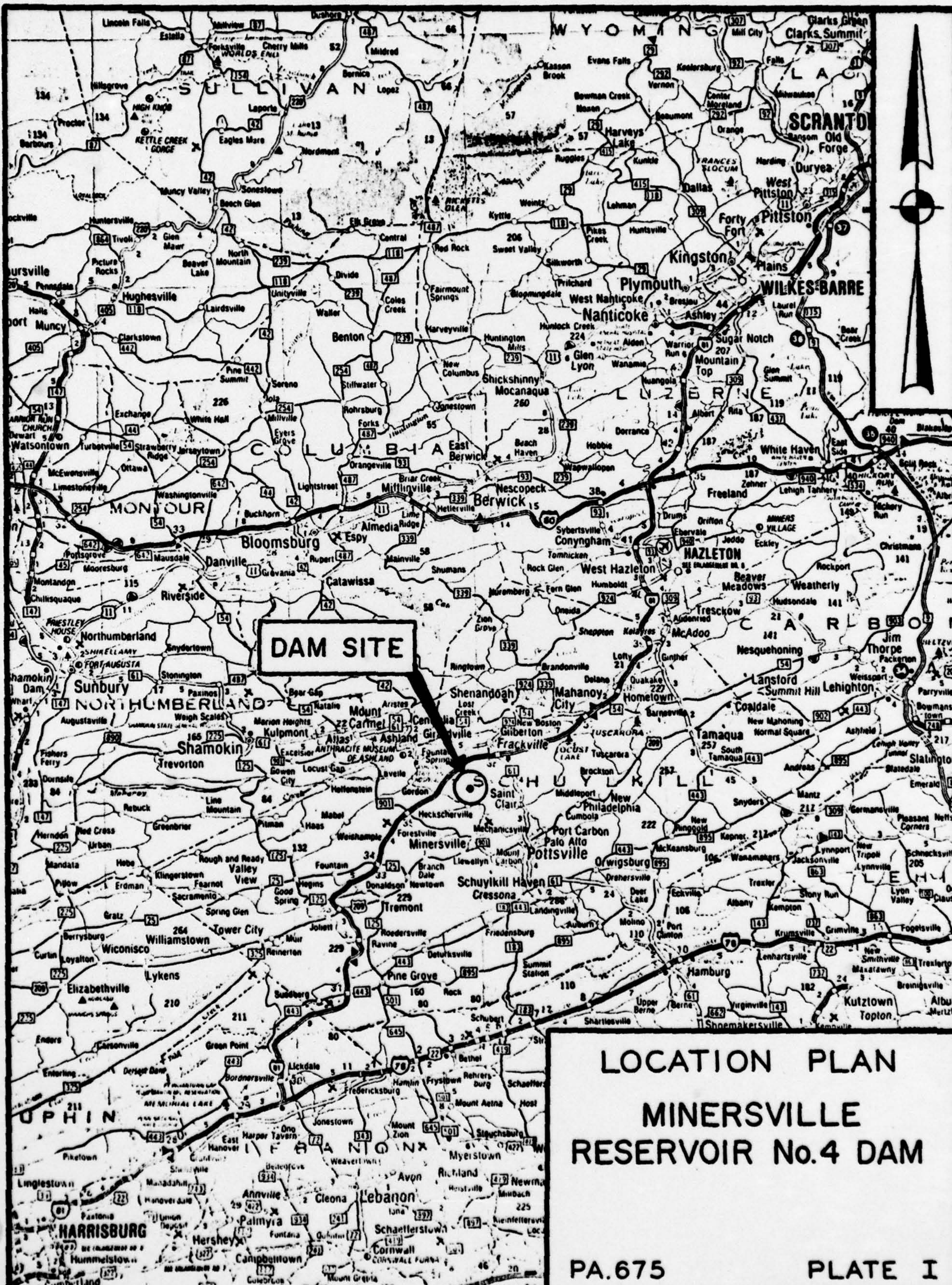
Blowoff Control Valve

Reservoir Area

PA-675
PLATE E-III

APPENDIX F

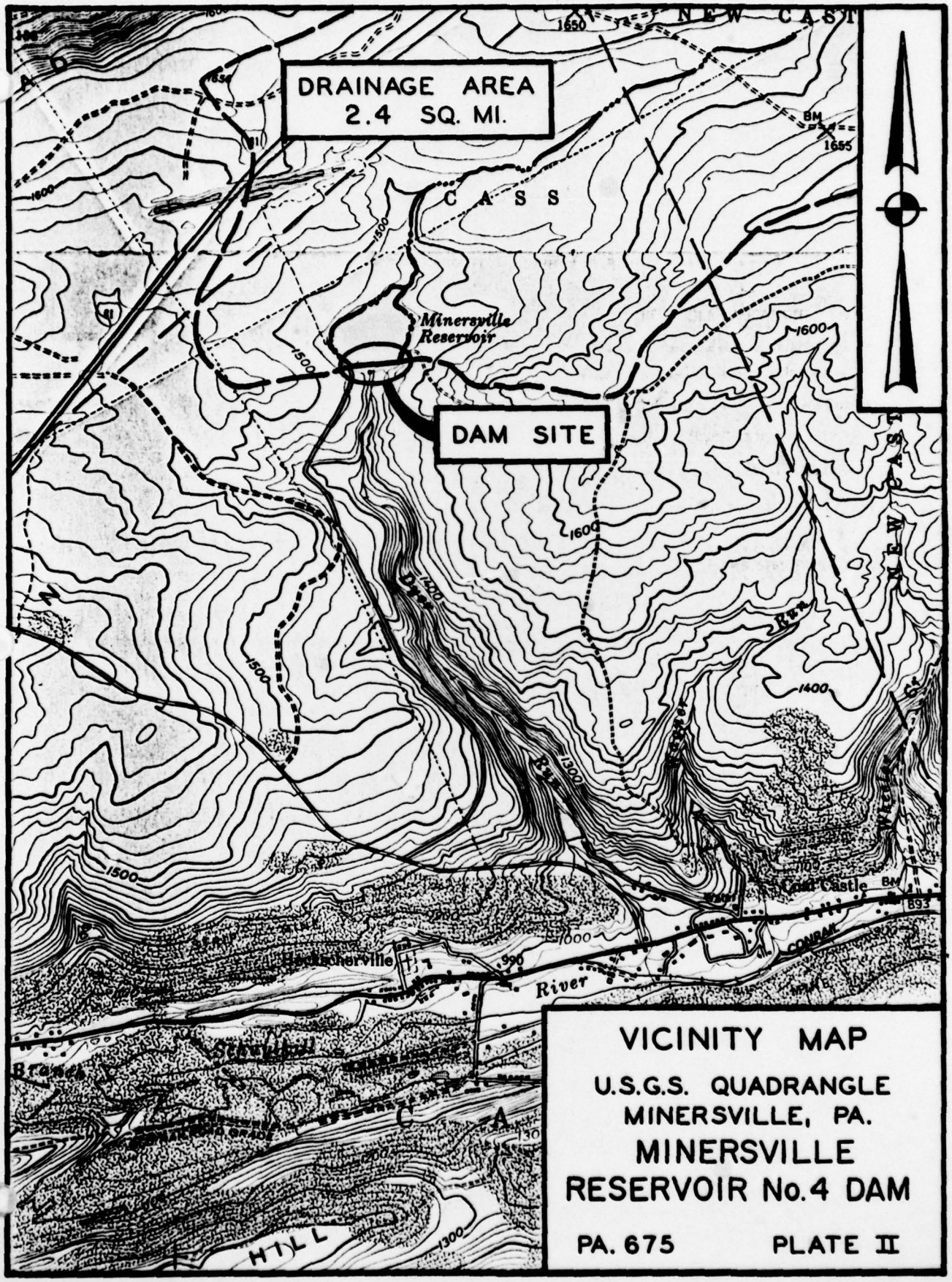
PLATES



LOCATION PLAN

MINERSVILLE RESERVOIR No.4 DAM

PA.675 PLATE I

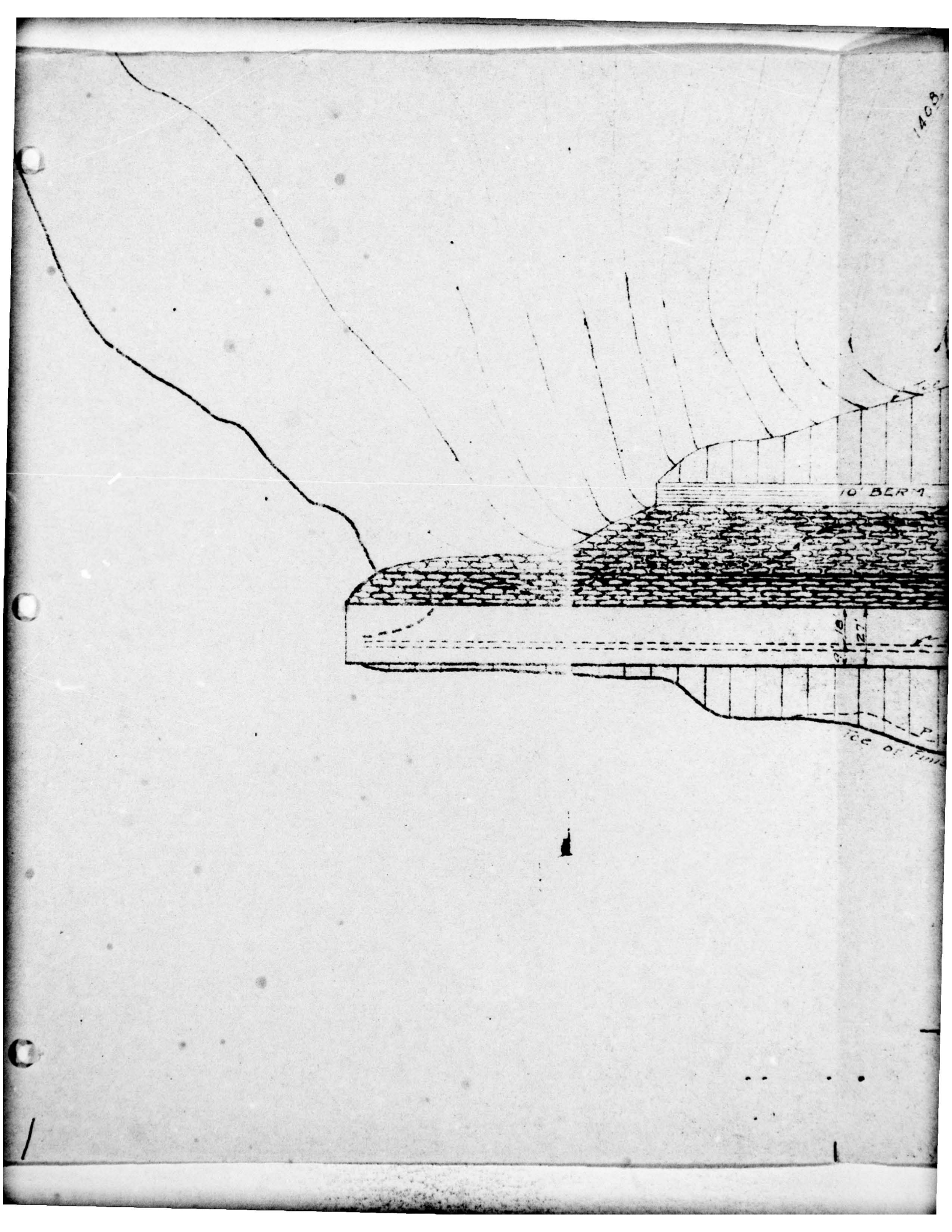


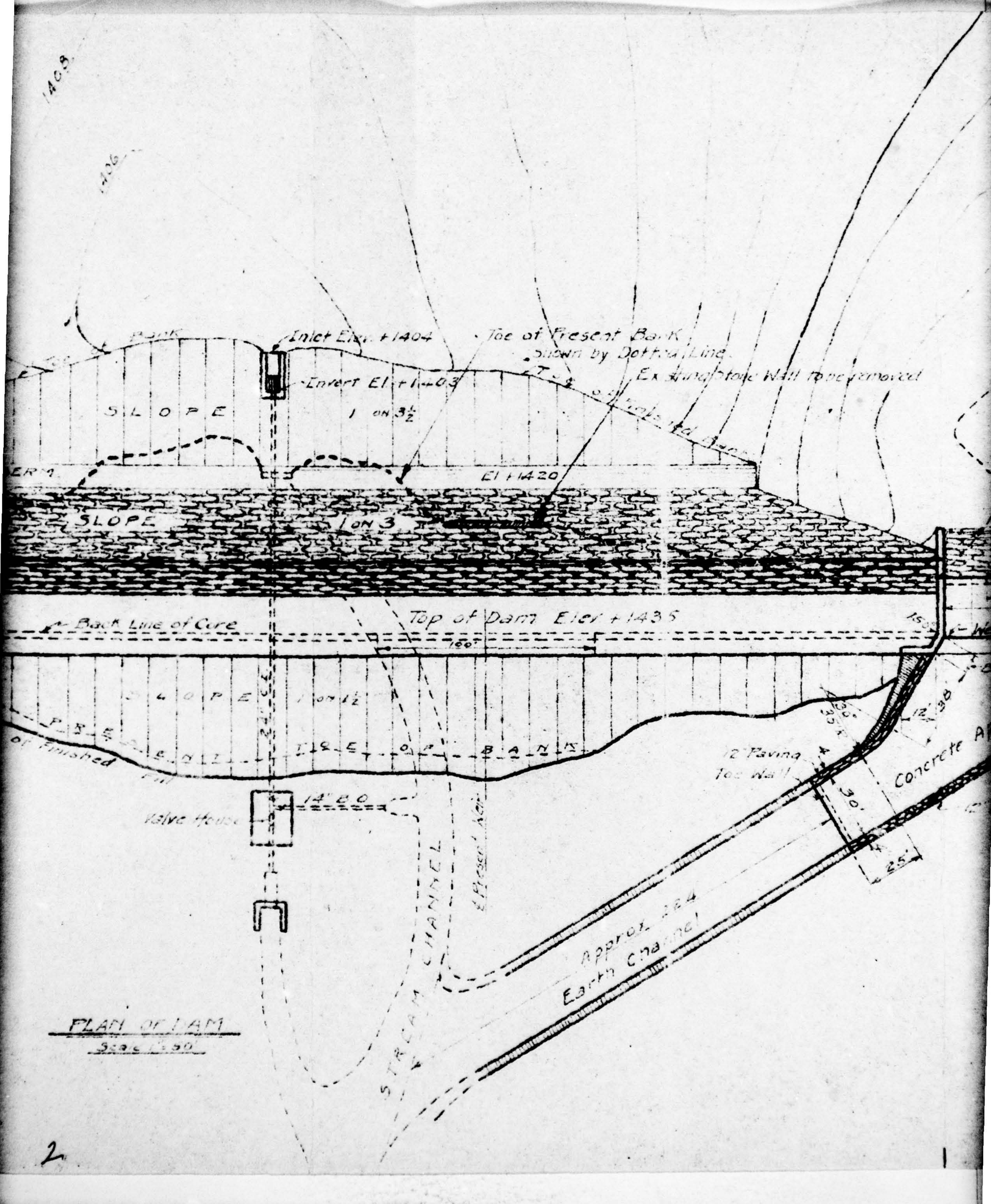
VICINITY MAP

U.S.G.S. QUADRANGLE
MINERSVILLE, PA.

MINERSVILLE RESERVOIR No.4 DAM

PA. 675 PLATE II

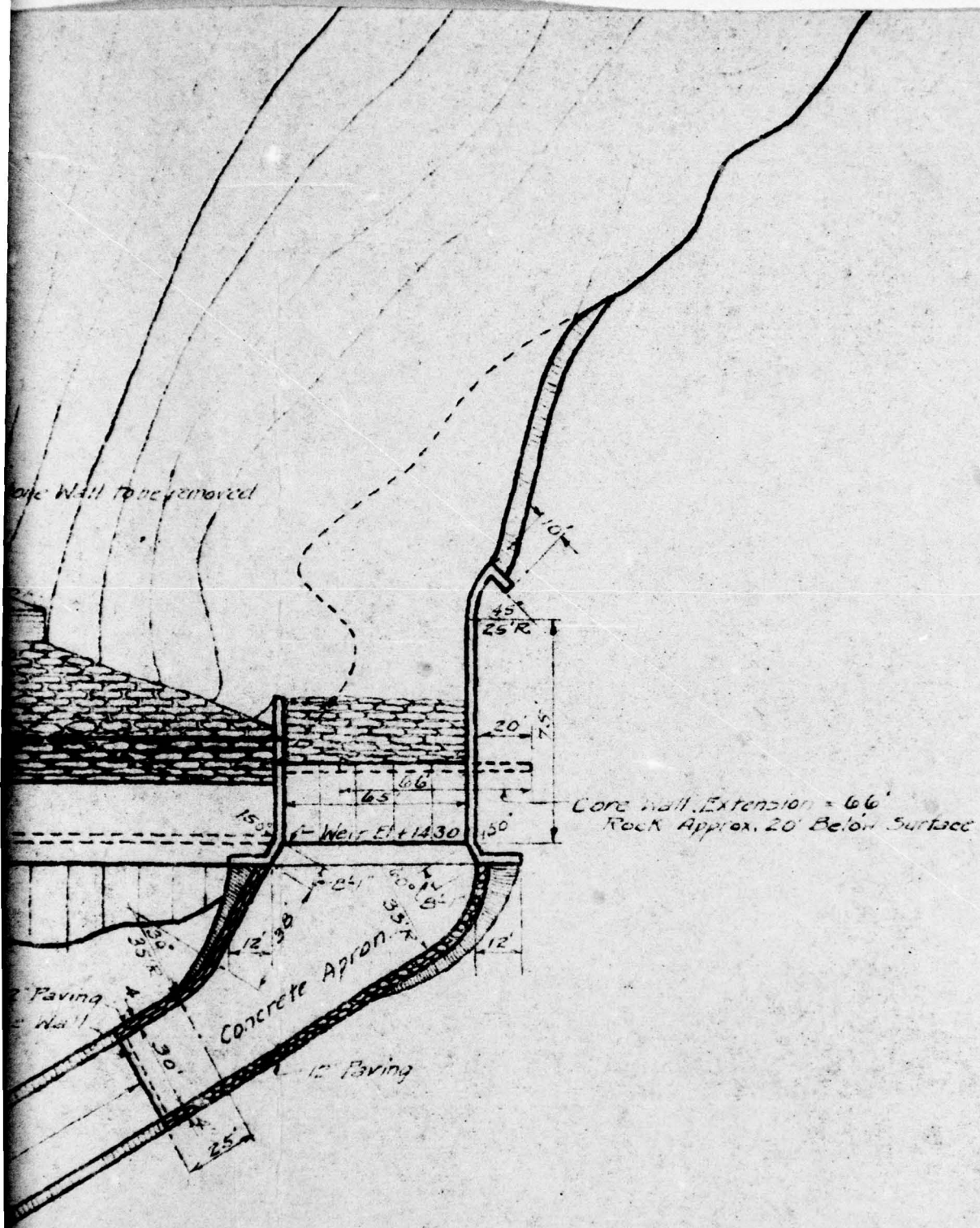

10' BERM
127'
10'
Toe of Fill



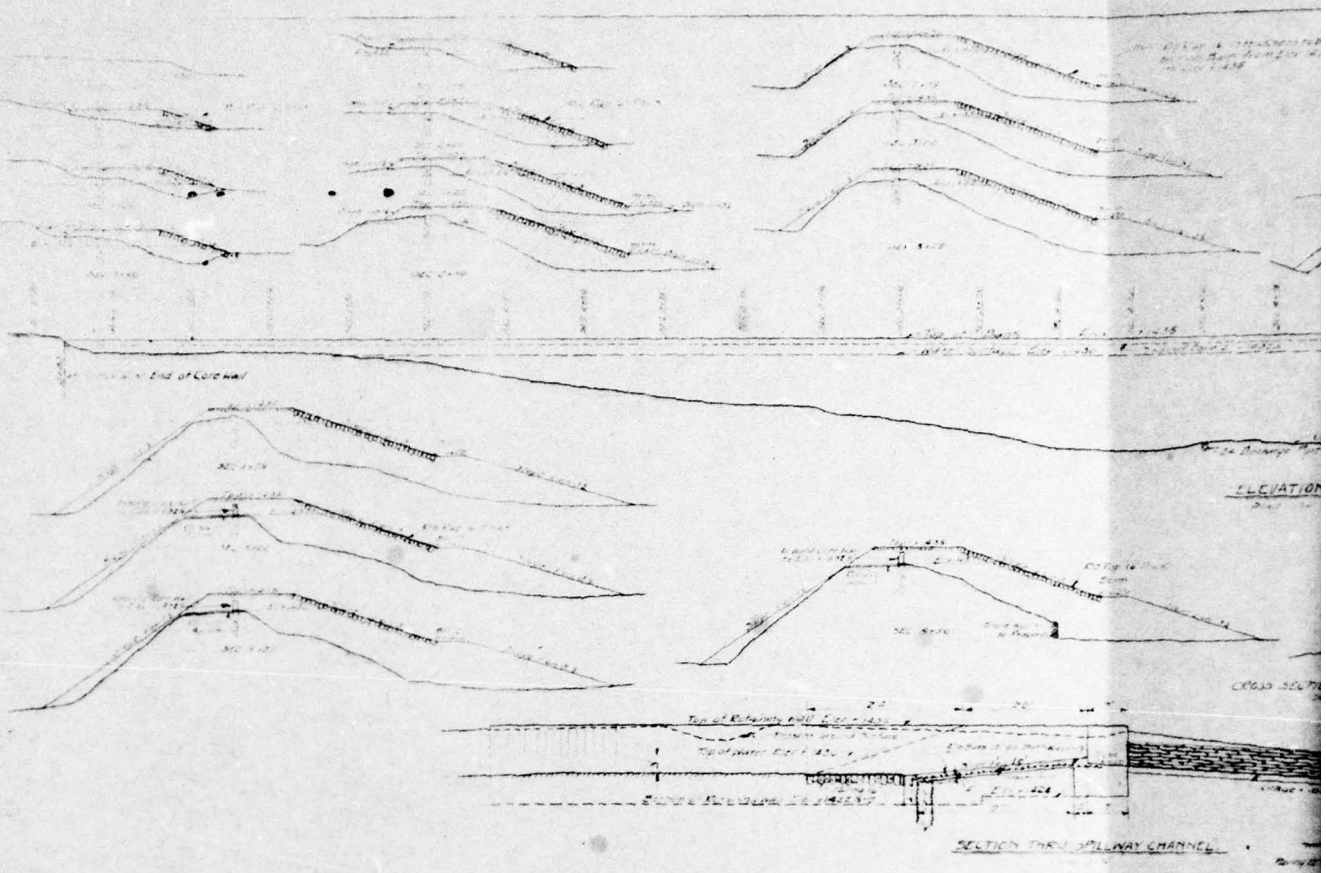
PLAN OF DAM

Scale 1" = 50'

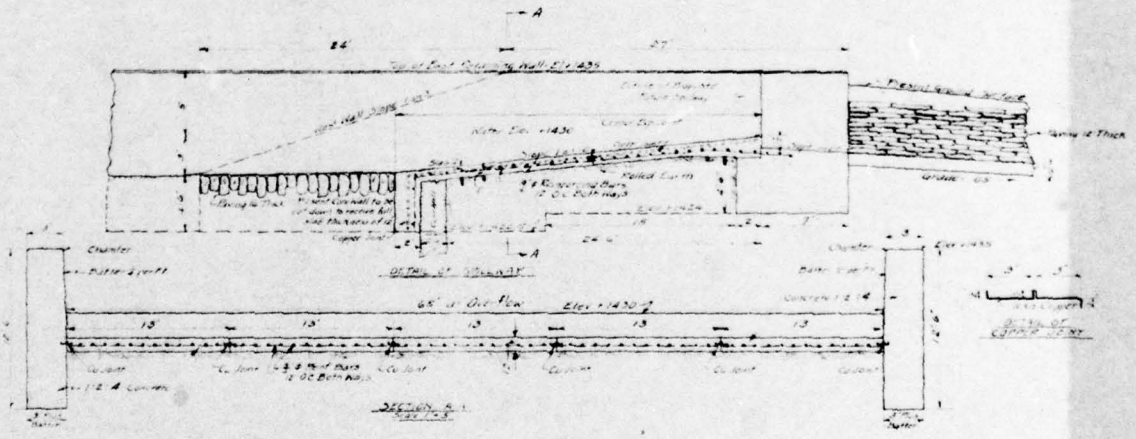
2



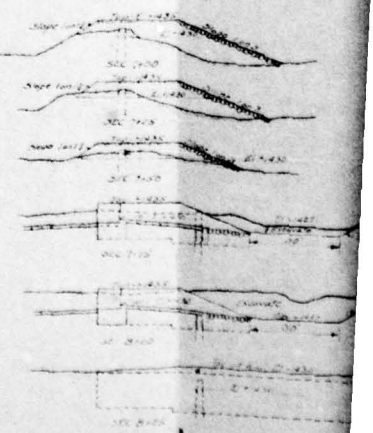
PA. 675 3
PLATE III

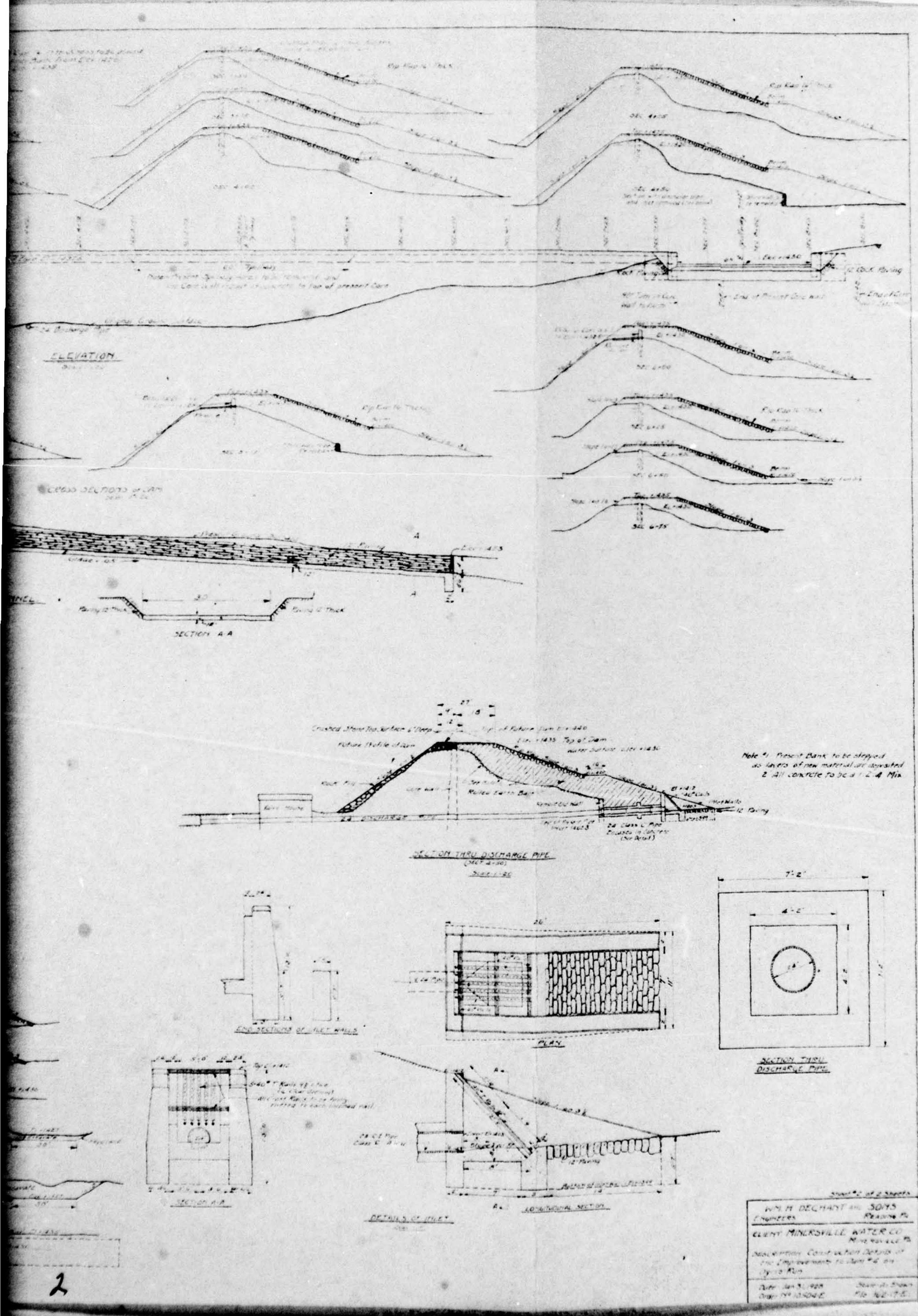


SECTION THRU SPILLWAY CHANNEL



SECTION THRU CORE WALL EXTENSION





PA. 675
PLATE IV

2